REMARKS

I. GENERAL

Claims 15, 35 and 37 have been amended merely to clarify the subject matter recited therein, and not for any reason relating to patentability. Claims 1-40 are under consideration in the present application. Provided above, please find a claim listing on separate sheets which indicates the status of the claims so as to comply with the requirements set forth in 37 C.F.R. § 1.121. It is respectfully asserted that no new matter has been added.

II. THE REJECTION UNDER 35 U.S.C. § 112 SHOULD BE WITHDRAWN

Claims 15-33, 35 and 37 stand rejected under 35 U.S.C. § 112, second paragraph, for the first time, as being allegedly incomplete amounting to a gap between the necessary structural connections. The Examiner believes that it is unclear and ambiguous as to what elements the recitation of the "likelihood of an association" is mean to associate. Applicants respectfully disagree, and submit that such recitation is abundantly clear to those having ordinary skill in the art.

However, in order to expedite the prosecution of the above-referenced application, and not for any reason related to patentability, independent claims 15, 35 and 37 have been amended above to recite that the first data for each one of the at least one first point including first information indicative of a likelihood of an association of the first data **with** at least a first part of the respective first point, and that the second

data for each one of the at least one second point including second information indicative of a likelihood of an association of the second data **with** at least a second part of the respective second point. It should be abundantly clear to that the first data includes information as to the likelihood that such data is associated with a part of one point in space, and that the second data includes information as to the likelihood that such data is associated with a part of another point in space. Such collective information relating to the likelihood of the association are used to associate each such point in space with the respective data. Thus, in view of the reasons presented herein above, Applicants respectfully assert that the rejection of claims 15-33, 35 and 37 under 35 U.S.C. § 112, second paragraph should be withdrawn.

III. THE REJECTION UNDER 35 U.S.C. § 103(a) SHOULD BE WITHDRAWN

Claims 1-14, 34-36 and 38-40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,201,035 issued to Stytz et al. (the "Stytz Patent"), in view of U.S. Patent No. 5,797,012 issued to Blainey et al. (the "Blainey Patent") and U.S. Patent No. 5,748,844 issued to Marks (the "Marks Patent"). It is respectfully asserted that independent claims 1, 34 and 36, claims 2-14 and 38 which depend from claim 1, claim 39 which depends from claim 34, and claim 40 which depends from claim 36 are in no way taught or suggested by the alleged combination of the Stytz, Blainey and Marks Patents for at least the reasons set forth below.

In order for a claim to be rejected for obviousness under 35 U.S.C. § 103, not only must the prior art teach or suggest each element of the claim, the prior art must also suggest combining the elements in the manner contemplated by the claim. *See Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 934 (Fed. Cir.), *cert. denied* 111 S.Ct. 296 (1990); *see In re Bond*, 910 F.2d 831, 834 (Fed. Cir. 1990).

One exemplary embodiment of Applicants' invention, as recited in independent claim 1, relates to a method of segmenting input data representing an image in order to locate a part of said image, with the input data comprising voxels. The method comprises the steps of, inter alia:

(a) storing a graph data structure in memory of a computer system, said graph data structure comprising nodes and edges having weights, ... **said nodes comprising at least one first node s, at least one second node t, and a plurality of voxel nodes** ...;

(b) designating one of said voxel nodes as corresponding voxel node for each of said voxels;

(c) **partitioning said nodes into at least two groups, one including said first node s and another one including said second node t, by a minimum-cut algorithm;** and

(d) partitioning said voxels into at least two segments by **assigning each of said voxels to the segment corresponding to the group to which said corresponding voxel node for the voxel belongs.**

Independent claims 34 and 36 relate to a system and software storage medium, respectively, and recite similar subject matter.

As described in great detail in the previous responses, the Stytz Patent relates to a dynamic algorithm selection to accomplish volume rendering along with

isocontour and body extraction with a multiple-instruction, multiple-data microprocessor. (See Stytz Patent, column 1, lines 15-18). According to the description provided in the Stytz Patent, with this technique, the time required to anti-alias, extract isocontours, and render a volume of interest within a three-dimensional volume is reduced. (See *id.*, column 2, lines 52-56). The volume is first partitioned among the processors of a multiple-instruction, multiple-data (MIMD) microprocessor computer. As the user indicates the isocontour to be extracted and a cutting plane location within the image space volume, each microprocessor independently selects the optimum algorithm for rendering a portion of the volume represented by its local data set. (See *id.*, column 2, lines 56-63). Each microprocessor independently selects the optimum algorithm for rendering the volume of a suite of algorithms, based on desired cutting plane location and isocontour to be displayed. (See *id.*, column 2, line 64 to column 3, line 2).

The Stytz Patent describes the use of recursive volume rendering (hidden-surface removal – HSR) algorithms and adapted recursive BTF (back-to-front) and FTB (front-to-back) volume rendering algorithms. (See *id.*, column 4, lines 50-58). The selection of an algorithm cutover point is described in the Stytz Patent with reference to Fig. 6 thereof. In particular, the basis for selecting either the adaptive FTB or BTF algorithm is the z'-dimension location of the cutting plane in image space. For the cutting planes close to the front of the scene, the adaptive BTF algorithm must process most of the data, whereas the adaptive FTB algorithm processes relatively little, giving the FTB algorithm the performance edge. As the cutting plane moves deeper into the

scene, the two algorithms approach the same performance until, at the cutover point, the overhead of the adaptive FTB algorithm equals the pixel overwriting cost of the adaptive BTF algorithm. From the cutover point to the back of the scene, the adaptive BTF algorithm is faster than the adaptive FTB algorithm. (See *id.*, column 13, lines 23-37; and Fig. 6).

In the Office Action dated May 28, 2003 and now in the Office Action dated December 18, 2003, the Examiner admitted that the Stytz Patent "does not teach a graph structure that demonstrates nodes in terms of edges and the partitioning process." (See Office Action, page 2). However, the Examiner apparently believes that the Blainey Patent cures some of these deficiencies.

The Blainey Patent relates to a method for partitioning programs into modules for an efficient compilation so as to pass through the compiler modular partitions of the program that are of a significant size, without overloading the system constraints on the memory size, while minimizing the grouping of conflicting attributes. (See Blainey Patent, column 1, line 66 to column 2 line 5). In particular, the computer program is compiled into compilation units in a multi-pass compiler. With such compilation, it is allegedly possible to generate a call-weighted multigraph having nodes denoting procedures in the computer program, weights on the nodes denoting relative intermediate code size, edges between the nodes representing execution calls, and edge weights representing estimated or actual execution call frequency. (See *id.*, column 3, lines 1-9). The edge weights are sorted from highest to lowest, an edge is

selected having a highest edge weigh, as well as any node or nodes connecting to such edge remaining for the selection, and the weight of the selected node or nodes is aggregated. Then, the edge and the selected node or nodes are divided into a compilation unit having an aggregate node weight not exceeding the size constraint on memory when the aggregate weight of the selected node or nodes is added, and the selected edge and the selected node or nodes are removed from selection. This procedure is performed for all edges (See *id.*, column 3, lines 1-9).

In the latest Office Action, the Examiner further admitted that the Stytz Patent does not teach that "nodes are partitioned into at least two groups by minimum cut algorithm." (Office Action dated December 18, 2003, page 3). However, the Examiner now alleges that the Marks Patent teaches such subject matter by apparently "partitioning a graph comprising a set of nodes and a set [of] edges or links ...[, and that] an initial partition (Fig. 4) [includes] ... its cut-set size (54)." (*Id.*) The Examiner also points to a section of the Marks Patent which cites an article directed to a "Min-Cut Algorithm." (See *id.*)

The Marks Patent relates to a prepartitioning system for partitioning graphs. (See Marks Patent, column 1, lines 8-10). This document discusses that by grouping together nodes in tightly connected subgraphs, clusters of nodes can be treated as individual supernodes during the application of standard methods. (See *id.*, column 2, lines 11-15). According to the Marks Patent, such idea is described various publications, some of which may be directed to a minimum cut algorithm. (See *id.*,

column 2, lines 15-43). The Marks Patent explicitly states that the "goal of any partitioning system is to divide the graph into two equal-sized sets as illustrated by dotted line 26 such that the number of edges from one part of the partition to the other (the size of the cut set) is minimized. The partition illustrated in FIG. 2 has a cut-set size of four, but ... a partition with a cut-set size of three ... [is] achievable." (*Id.*, column 5, lines 26-32; and FIG. 2). The Marks Patent goes on to state that "the goal is to minimize the weighted sum of the edges between the nodes in different subsets." (*Id.* at lines 36-37). Apparently, the Marks Patent uses Kernighan-Lin algorithm for later analysis of partitions. (See *id.*, column 7, lines 39-50).

As an initial matter, Applicants respectfully assert that the alleged combination of the Stytz Patent, the Blainey Patent, and the Marks Patent does not teach or suggest a method, system and software storage medium that segment input data (which includes voxel) representing an image in order to locate a part of the image, in which, *inter alia*, **nodes are partitioned into at least two groups by <u>a minimum-cut algorithm</u>**, as explicitly recited in independent claims 1, 34 and 36. As indicated in the Office Action, the Examiner admits that "Stytz does not teach nodes that are partitioned into at least two groups by minimum cut algorithm." (See Office Action dated May 28, 2003, page 3). However, the Examiner contends that the combination of the Marks and Stytz Patents allegedly cures this deficiency. The Examiner believes that "[o]ne would have been motivated in view of the suggestion in Marks that the partitioning steps as configured in Fig. 2 & Fig. 4 including the assigning nodes to

partition (x, y) are equivalent to the desired minimum-cut algorithm." (Office Action dated December 18, 2003, page 3, lines 16-18). Indeed, the Marks Patent only describes a graph partitioning technique that uses a seed-growth heuristic and a parallel hill-climbing method to partition the nodes, and not the minimum cut algorithm.

However, contrary to the Examiner's belief, there is absolutely no teaching or suggestion in the Marks Patent that the partitioning of the nodes by a segmentation process is "equivalent" to Applicant's claimed minimum-cut algorithm. Particularly, in the Marks Patent, there is absolutely no description of the use of the minimum-cut algorithm to be used with the apparent inventive process described therein. Indeed, while the Marks Patent describe clustering nodes using the concepts provided in certain publications that mention minimum-cut algorithms, the Marks Patent uses a completely different procedure to segment the nodes (e.g., the Kernighan-Lin Algorithm), and nowhere even mentions that the minimum-cut algorithm can be used for its apparently novel procedure to segment the nodes. For example, an exemplary embodiment of the present invention solves a problem of finding a "'minimum cut', that is, a cut with the minimum score." (Applicants' Specification, e.g., page 9, lines 27-29). Thus, in addition to the arguments presented herein above, the Marks Patent does not even mention, much less teach or suggest partitioning nodes using the minimum cut algorithm, such that, e.g., the minimum score is obtained by the partition. Therefore, the partitioning process described in the Marks Patent does not utilize the minimum-cut algorithm to segment the nodes, as recited in independent claims 1, 34 and 36.

Further, at least because claims 2-14 depend, either directly or indirectly, from independent claim 1, and because claims 38-40 depend, either directly or indirectly from independent claims 1, 34 and 36, Applicants respectfully assert that claims 2-14 and claims 38-40 are also not taught or suggested by the alleged combination of the Stytz Patent, the Blainey Patent, and the Marks Patent for at least the same reasons as provided above with references to claims 1, 34 and 36.

In addition and for at least the same reasons as discussed in great detail in Applicants' Response dated March 18, 2003, Applicants respectfully assert that the alleged combination of the Stytz Patent and the Blainey Patent, even if combined with the Marks Patent, does not teach or suggest that **the voxels are partitioned into at least two segments by assigning each of the voxels to the segment corresponding to the group (partitioned by the minimum-cut algorithm) to which a corresponding voxel node for the voxel belongs**, as also recited in independent claims 1, 34 and 36 of the above-identified application, respectively. In particular, as Applicants previously indicated, the Stytz Patent in no way partitions the voxels into at least two segments <u>by assigning each of the voxels to the segment corresponding to the group to which a corresponding voxel node for the voxel belongs</u>. Contrary to the Examiner's belief, the Blainey Patent does not cure this deficiency of the Stytz Patent. While the Blainey Patent may describe dividing the edge and selected nodes into a compilation unit, the nodes described in the Blainey Patent are in no way <u>voxels</u>. Thus, the Blainey Patent, even if combined with the Stytz Patent, does not teach or suggests

that voxels are assigned to the segment, as recited in independent claims 1, 34 and 36 corresponding to the group to which a voxel node for such voxel belongs. Furthermore, the Blainey Patent does not teach or suggest that the voxel is assigned to a segment corresponding to the group that was partitioned by the minimum-cut algorithm. In addition, the Marks Patent does not cure the deficiencies of the Stytz and Blainey Patents to teach or suggest such subject matter, nor does the Examiner contend that it does.

Accordingly, for this additional reason the alleged combination of the Stytz, Blainey and Marks Patents does not teach or suggest the subject matter recited in independent claims 1, 34 and 36.

As also discussed in Applicants' Response dated March 18, 2003, with respect to claim 8, this claim recites the assignment of weights to first and second edges **which are associated with likelihood numbers for the voxels**. In this Office Action, the Examiner referred to column 17, lines 34-37 of the Stytz Patent which allegedly provides teaching or suggestion of such recitation. However, the Stytz Patent does not even mention the use of any weights associated with the edges. The Blainey Patent describes edge weights actual or estimated call frequency. (See Blainey Patent, column 3, lines 7-9). In particular, the "weight" of an edge between two procedures as described in the Blainey Patent represents the execution count, i.e., the number of times that one procedure calls another. (See id., column 3, lines 50-52). However, the Blainey Patent in no way teaches or suggests that the weights are associated with

likelihood numbers for the voxels, as recited in claim 8. The Marks Patent describes the association of arbitrary weights with the edges (see Marks Patent, column 7, line 65 to column 8, line 7), but does not cure the deficiencies of the alleged combination of the Stytz and Blainey Patents to teaches or suggests that the weights are associated with **likelihood numbers for the voxels**.

Accordingly, Applicants respectfully request that the rejection of claims 1-14, 34, 36 and 38-40 under 35 U.S.C. § 103(a) as being unpatentable over the Stytz Patent, in view of the Blainey Patent and the Marks Patent be withdrawn.

IV. CONCLUSION

In light of the foregoing, Applicants respectfully submit that pending claims 1-40 are in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,

Dated: April 13, 2004

By: ______________________

Gary Abelev
Reg. No. 40,479

Attorney for Applicant(s)

BAKER BOTTS L.L.P.
30 Rockefeller Plaza, 44th floor
New York, New York 10112-0228
(212) 408-2522